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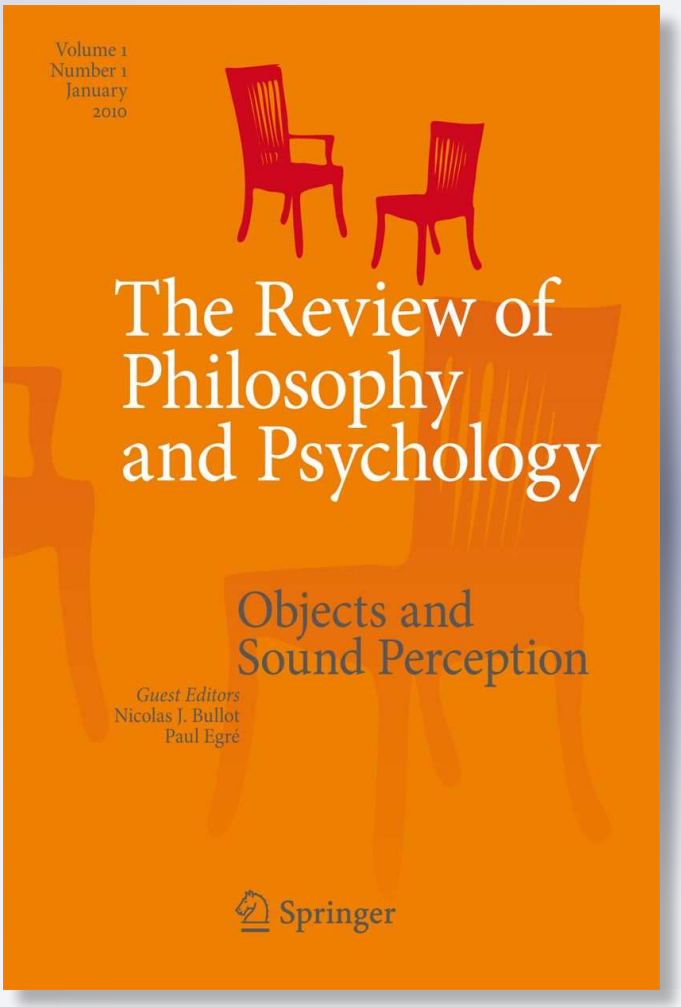

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Embodying the Mind by Extending It

Pierre Jacob

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Abstract To subscribe to the embodied mind (or embodiment) framework is to reject the view that an individual's mind is realized by her brain alone. As Clark (2008a) has argued, there are two ways to subscribe to embodiment: bodycentrism (BC) and the extended mind (EM) thesis. According to BC, an embodied mind is a two-place relation between an individual's brain and her non-neural bodily anatomy. According to EM, an embodied mind is a threeplace relation between an individual's brain, her non-neural body and her non-bodily environment. I argue that BC can be given a weak and a strong interpretation, according to whether it accepts a functionalist account of the contribution of the non-neural body to higher cognitive functions and a computational account of the contents of concepts and the nature of conceptual processing. Thus, weak BC amounts to an incomplete version of EM. To accept a weak BC approach to concepts is to accept concept-empiricism. I raise four challenges for concept-empiricism and argue that what is widely taken as evidence for concept-empiricism from recent cognitive neuroscience could only vindicate weak BC if it could be shown that the non-neural body, far from being a tool at the service of the mind/brain, could be constitutive of the mind. If correct, EM would seem able to vindicate the claim that both bodily and non-bodily tools are constitutive of an individual's mind. I scrutinize the basic arguments for EM and argue that they fail. This failure backfires on weak BC. One option left for advocates of BC is to endorse a strong, more controversial, BC approach to concepts.

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1 Introduction

'Embodied cognition', 'embodied mind' or 'embodiment' (for short) have become increasingly fashionable labels in the philosophy of mind and the cognitive sciences: it seems as if cognitive science is bringing the body out of the closet. As Margolis and Laurence (2006) have put it on behalf of advocates of the embodiment research program, "the type of body that an organism has profoundly affects its cognitive operations as well as the way that the organism is likely to conceptualize the world". Now unless one subscribes to Cartesian ontological substance dualism between minds and bodies, it seems uncontroversial that to a large extent, human cognition (or the human mind) is shaped by the human body and is, therefore, embodied (cf. Rowlands 2010).

It seems clear, however, that advocates of embodiment do not merely mean to embrace ontological physicalism and to reject substance dualism. In fact, what they mean to reject is the assumption that an individual's mind is identical to, supervenes upon, or is realized by, her *brain alone*. In other words, they reject the version of physicalism according to which an individual's brain alone is sufficient to embody the individual's mind. What does it take for a mind to be embodied? As Clark (2008a) has argued, there are two distinct answers to this question: the *body-centric* and the *extended mind* answers. To put it briefly, according to body-centrism, an embodied mind is a *two*-place relation holding between an individual's brain and her non-neural bodily anatomy. According to the extended mind thesis, what makes a human mind "the locus of intelligence" is that it is both "intimately embodied" and also "intimately embedded in its world", to borrow Haugeland's (1998) terminology. In other words, an extended mind is a *three*-place, not a two-place, relation between an individual's brain, her non-neural bodily anatomy and the world.

Now, advocates of either body-centrism or the extended mind thesis do not merely mean to stress the obvious point that the execution of human actions (e.g. locomotion or the dexterous manipulation of objects) and human perceptual processes (e.g. vision, audition or touch) causally depend on the human anatomy, e.g. the human eye, ear or skin (cf. M. Wilson 2002 and R. Wilson and Foglia 2011 for surveys). Instead, they typically accept stronger and more controversial claims, such as e.g. that the character and content of human perceptual experiences are *constitutively* determined by the human anatomy, as are the contents of human concepts and the nature of human conceptual processing.[1] In this paper, I will focus on the body-centric claims that the contents of human concepts and the nature of conceptual processing are constitutively dependent, not just on the resources internal to an individual's brain, but on her non-neural bodily anatomy as well.

As I will argue, there are two possible (a weaker and a stronger) versions of a body-centric approach to the contents of human concepts and the nature of conceptual processing, according to whether or not body-centrism accepts a functionalist approach to the role of the non-neural body in higher cognitive functions. So long as body-centrism accepts a *functionalist* approach to the role of the body it amounts to an incomplete version of the extended mind thesis. While Clark (2008a: 39) calls the extended mind thesis "the larger mechanism story" (LMS), he also calls the version

[1] For an extensive discussion of the distinction between the causal and the constitutive dependency of human perceptual experience upon bodily anatomy and action, cf. Block (2005) and Aizawa (2007).

of body-centrism that is not merely an incomplete version of the extended mind thesis "the special (bodily) contribution story".[2] As Clark (2008a: 56–57) puts it, LMS or extended functionalism depicts "the body as just one element in a kind of equal-partners dance between brain, body and world, with the nature of the mind fixed by the overall balance thus achieved". But on the special (bodily) contribution story, which rejects a functionalist approach to the body and which I will call *strong* body-centrism, the non-neural bodily environment of an individual's brain makes such a special contribution to the individual's mind that it cancels the role of the non-bodily environment. Furthermore, because they both accept a functionalist account of the non-neural body, both the full extended mind thesis and its incomplete version, *weak* body-centrism, are compatible with the computational approach to the mind. But strong body-centrism is not.

I will first consider a weak body-centric approach to human concepts and the nature of conceptual processing that is compatible with the computational approach, namely concept-empiricism. After considering some of the putative evidence in favor of concept-empiricism, I will argue that this evidence could support weak body-centrism only if weak body-centrism could successfully show that, far from being a mere tool at the service of her mind/brain, an individual's body is a constitutive part of her mind. I will further argue that, if correct, the extended mind thesis would offer such an argument in support of weak body-centrism. But I will argue that the extended mind thesis itself faces serious objections. These objections backfire on weak body-centrism.

2 Weak Body-Centrism and the Computational View of the Mind

The computational view of the mind is the view that mental processes are computational processes that apply to mental representations, i.e. mental symbols with syntactic and semantic properties. In Fodor's (1975) terms, no computation without representation: computationalism entails representationalism. But the converse does not hold: it is possible to subscribe to a representationalist view of the mind without endorsing computationalism. What made the computational approach to the mind attractive in the first place (cf. Fodor 1994, 1998) was that it promised to solve an outstanding puzzle inherited from ontological Cartesian dualism: how could anything physical (or material) be *rational*? How could rationality be mechanized? The sense of rationality at issue here is the parallelism between the causal and the semantic properties of an individual's thoughts.

A popular solution has been the *language of thought* hypothesis, according to which thinking is a syntactic or computational process consisting of the manipulation of mental symbols with both syntactic and semantic properties, according to their *syntactic* properties alone. Thinking can be rational because syntactically specified operations can be truth preserving insofar as they reconstruct relations of logical form. Thinking can also be mechanical because Turing machines are machines that can manipulate formal symbols according to their syntactic properties alone. On this

[2] Dempsey and Shani (2012) calls it "strong embodiment".

picture, the parallelism between the causal and the semantic properties of thoughts (i.e. rationality) is mechanically preserved because the brain is a syntactic engine, and the causal and the semantic properties of mental symbols are mediated by their syntactic properties.

On the basis of an analogy between computational states and psychological states, Putnam (1967) and Fodor (1974) argued that computational states and properties could be realized or implemented by many different physical states and properties. They further argued that it would be a mistake to identify a computational property with one of the many possible physical properties that could realize it. Now, if a psychological property is a computational property that could also be realized by several distinct underlying physical properties, then it would also be a mistake to identify the psychological property with a neural property. So the computational approach to the mind has been widely taken to support the celebrated argument for the *multiple realizability* of psychological properties against reductionist versions of physicalism. In other words, the computational approach to the mind supports a *functionalist* conception of the nature of psychological states and the autonomy of psychological explanation. In short, multiple realizability or functionalism in the philosophy of mind was seen as the price to pay for solving the puzzle from Cartesian ontological dualism of how to naturalize rationality.

If an individual's mind is taken to be realized by the individual's brain alone, then the computational approach to the mind amounts to the computational view of the brain. However, both body-centrism and the extended mind thesis deny that an individual's mind can be realized by the individual's brain alone. While body-centrism maintains that an individual's mind is realized by an individual's brain and her non-neural bodily anatomy, the extended mind thesis maintains that an individual's mind is realized by an individual's brain, her non-neural bodily environment and her non-bodily environment. The question is: to what extent does the rejection of the view that an individual's mind is realized by her brain entail the rejection of the computational approach to the mind? As Clark (2008a, b) makes abundantly clear, Clark and Chalmers's (1998) version of the extended mind thesis—which Clark also calls "extended functionalism"—is quite compatible with the computational approach to the mind when the mind is extended from an individual's brain to her non-neural bodily environment and her non-bodily environment. But as Clark (2008a) further emphasizes, strong versions of body-centrism, which insist on the special role of the human non-neural bodily environment (which he also refers to as "the flesh") for human cognition, reject the computational approach to the mind.

Some advocates of strong body-centrism reject the computational approach to the mind on the grounds that it entails the thesis of *multiple realizability* (i.e. a functionalist view of psychological properties), which in turn entails the thesis of *body neutrality* and the thesis of the *separability* of an individual's mind from her body, both of which they reject (cf. Shapiro 2004, 2007). Thus, one of the major motivations for strong body-centrism is skepticism towards the view that the mind is multiply realizable. Others reject the computational approach on the grounds that it presupposes or entails a *representationalist* approach to mental phenomena, which they reject for various reasons. Some reject representationalism because they endorse an *enactivist* approach that gives a primary role to the possession and exercise of

bodily skills in the execution of cognitive tasks (cf. Noë 2004). Others reject representationalism because they endorse a *phenomenological* approach that gives a primary role to bodily schemas and/or the experience of bodily feelings in the execution of cognitive tasks (cf. Gallagher 2005 and Dempsey and Shani 2012).[3]

Both the extended mind thesis and weak body-centrism can be seen as compatible with the computational approach to the mind to the extent that some non-neural bodily tools and non-bodily tools can be relevantly construed as representations (lying outside an individual's brain) to which computations can apply.[4] Indeed, following Goldman and de Vignemont's (2009) useful distinction between the *bodily content* and the *bodily format* of a mental representation, Gallese and Sinigaglia (2011: 513) have recently expressed their endorsement of a version of weak body-centrism that is consistent with the representationalist commitments of the computational approach to the mind:

> We subscribe to this view of embodiment, according to which mental states or processes are embodied primarily because of their bodily format. In a nutshell, the idea is that, just as a map and a series of sentences might represent the same route with a different format, so mental representations might have partly overlapping contents (e.g., a motor goal, an emotion or sensation) while differing from one another in their format (e.g., bodily instead of propositional). We propose that the format of a mental representation constrains what a mental representation can represent. For instance, in planning and executing a motor act such as grasping a cup, bodily factors (e.g. bio-mechanical, dynamical and postural) constrain what can be represented.

In what follows, I will restrict my discussion of body-centrism to versions that are not inconsistent with the computational approach.

3 Concept-Empiricism: A Weak Body-Centric Approach to the Nature of Concepts

To accept a weak body-centric view of higher cognitive functions (conceptual processing and the nature and contents of concepts) that is not incompatible with computational assumptions is to embrace an empiricist view of concepts and conceptual processing, i.e. that conceptual processing is grounded in, or reducible to, sensory and motor processes. This view follows from weak body-centrism on the further assumption that sensory and motor processes in an individual's brain could not generate representations of an individual's bodily properties unless the individual's brain was properly connected to her body: an individual's bodily properties could not be represented unless they were instantiated. Furthermore, what makes it consistent with computational assumptions is that it is compatible with a representational

[3] In fact, one of the motivations for endorsing the view that the non-neural body makes a special contribution to the mind is to cast doubt on the extent to which the mind is really multiply realizable.

[4] Arguably, advocates of either the extended mind thesis or weak body-centrism should be inclined to call such representations *mental* (cf. Adams and Aizawa 2008 for a critique).

approach to conceptual processing (cf. e.g. Barsalou 1999; Barsalou et al. 2003; Gallese and Lakoff 2005; Gallese and Sinigaglia 2011). First, I will spell out the basic assumptions of concept-empiricism and raise four related challenges for concept-empiricism. Secondly, I will challenge the body-centric interpretation of some selected empirical findings that are widely taken to support concept-empiricism.

3.1 Concept-Empiricism

Concept-empiricism involves three basic ingredients. First, as emphasized by Barsalou (1999) and Prinz (2005), it is based on the rejection of the *linguistic* model of concepts as *amodal* symbols in some language of thought, whose meanings (or contents) stand to their non-phonetic forms (or vehicles) in the same *arbitrary* relation as the meanings of words of natural languages stand to their phonetic properties (cf. Barsalou et al. 2003). Secondly, on the empiricist view, concepts are (visual, auditory, olfactory, tactile or motor) *images* encoded in the various perceptual and motor systems. Finally and correlatively, conceptual processing is taken to be a *re-enactment* or *simulation* of basic perceptual and motor processing (cf. Machery 2006, 2007). For example, retrieving the concept DOG would consist in re-enacting or simulating some perceptual representation or mental image of a dog.[5]

While psychologists stress the role of concepts in tasks of categorization, recognition, induction and reasoning, philosophers insist that concepts are constituents of thoughts, in particular truth-evaluable beliefs and other propositional attitudes. Now the first thing to notice about concept-empiricism is that the first two theses presuppose the distinction between the *content* and the *vehicle* of a concept. In fact, the word 'concept' is sometimes used to refer to conceptual contents, sometimes to conceptual vehicles (i.e. conceptualized mental representations). Whether or not one subscribes to concept-empiricism, this distinction seems to be justified by the fact that we need to be able to distinguish between two concepts with one and the same content that applies to the same things (or express one and the same property). For example, many philosophers would assume that the concepts WATER and H2O apply to the same substance (or express the same property), but are distinct nonetheless. If so, then they have the same content, but arguably their possession conditions are distinct: only someone who possesses the constituent concepts HYDROGEN, TWO and OXYGEN could possess the latter. But this condition does not apply to the possession of the concept WATER. Thus, one way to draw the distinction between two concepts with the same content is to distinguish their respective vehicles.

The second thing to notice about concept-empiricism is that it is parsimonious, because in accordance with Ockham's razor, all it postulates are perceptual and sensorimotor processes, vehicles and contents. But its parsimony is also what makes it controversial. While some philosophers (e.g. McDowell 1994) have denied the distinction between conceptual and non-conceptual content on the grounds that the content of perceptual experiences is fully conceptual, advocates of concept-empiricism also deny the same distinction, but for the opposite reason: they assume that all content is fully perceptual and/or sensorimotor. As a result, concept-

[5] I follow the standard philosophical practice of referring to concepts by using words in capital letters.

empiricism faces at least four related challenges: the first is Descartes' problem of abstract contents with which I start.

In his *Sixth Metaphysical Meditation*, Descartes famously pointed out that one can both think of a triangle as a closed geometrical figure with three sides and imagine it, but one can only think (or conceive) of a chiliagon as a closed geometrical figure with 1,000 sides. One's geometrical concept of a chiliagon is clearly distinct from one's concept of a geometrical figure with 999 sides. But one cannot imagine a chiliagon, let alone form a mental image of a chiliagon, distinct from a mental image of a figure with 999 sides. Descartes' problem generalizes to a lot of abstract contents: the challenge for concept-empiricism is to account for logical concepts (e.g. AND, IF… THEN, EVERY), arithmetical concepts (e.g. ZERO, PRIME NUMBER), semantical concepts (e.g. TRUTH) or legal/political concepts (CONSTITUTION), on a perceptual basis.

The second challenge faced by concept-empiricism is the binding problem. While it is clear that one can perceive dogs, as opposed to e.g. prime numbers or centers of gravity, it is not clear that one can see a generic dog (or doghood). One can think about dogs by means of the concept DOG and thereby form the universally quantified thought or belief that *all dogs bark*, but one can only see a poodle, an alsatian, a dalmatian, a bulldog and so on. The concept DOG applies indiscriminately to poodles, alsatians, dalmatians and bulldogs, but seeing one of them is very different from seeing another: it involves processing such visual attributes as its shape, height, orientation, color and texture of its hairs. Clearly, one may also *hear* one of these animals bark. Now the problem for concept-empiricism is to account for *cross-modal binding* between a visual and an auditory representation of a particular perceived dog, *without* positing amodal vehicles, in accordance with the first thesis. The problem is that the binding mechanism must ascribe the visual and the auditory properties to one and the same individual dog. So the binding mechanism must have available a symbol standing for this individual, but the symbol must be neither strictly visual nor strictly auditory: rather, it must be cross-modal or amodal, in accordance with the linguistic model that concept-empiricism rejects.

The third related challenge is the belief/experience distinction. Among the reasons why we need to draw a distinction between perceptual beliefs and perceptual experiences are perceptual illusions. For example, when one is presented with two segments of equal length, with arrows pointing respectively in and out (as in the Müller-Lyer illusion), the former unavoidably looks longer than the latter. Even if one correctly believes that the two segments are equal, one visually experiences the former as longer than the latter. One's visual experience represents the two segments as unequal even if one believes that they are equal. This shows that the content of one's visual experience is encapsulated from the content of one's beliefs in Fodor's (1983) terms: unlike a belief, a visual experience is not revisable in light of further evidence. Assuming that the content of one's belief that the two segments are equal is conceptual and that what makes beliefs revisable is the fact that their content is conceptualized, it follows that the content of one's visual experience representing the two segments as unequal is non-conceptual. Furthermore, as Crane (1992: 152) has put it, "there is no such thing as deductive inference *between* perceptions". Upon seeing a brown squirrel, one may visually experience the animal's properties of being both a squirrel and brown in color. But if so, then the way the two properties are bound in one's perceptual non-conceptualized experience is not deductive inference.

Only the beliefs that the animal is brown and that the animal is a squirrel can give rise to the new conjunctive belief that the animal is a brown squirrel, in virtue of the conceptual contents of beliefs. In brief, it is not clear how concept-empiricism can account for the belief/experience distinction.

The fourth challenge faced by concept-empiricism is the logical form challenge. Advocates of the view that conceptual vehicles are amodal symbols in some language of thought, like Fodor (1975), have argued that whereas the content of a primitive concept (e.g. DOG) is not further definable, the content of a complex concept (e.g. BLUE DOG) systematically depends on the contents of its constituents. They argue that symbols with conceptual content have a logical form, or in Fodor's (2007) terms, a "canonical decomposition", so that not every part of a complex symbol with conceptual content is one of its proper constituents. As a result, some constituents of a representation with conceptual content will stand for individuals, others for properties, still others for logical operations. Of course, symbols with conceptual content are not the only kinds of mental representations governed by a compositionality principle. As Fodor (2007) has further argued, unlike symbols with conceptual content, iconic representations with non-conceptual content lack a canonical decomposition, so that every part of an iconic representation can be a constituent. Although pictures, which are iconic representations with non-conceptual content, lack logical form, they nonetheless obey the following principle of compositionality: if *P* is a picture of *X*, then any part of *P* will be a picture of some part of *X*. If advocates of concept-empiricism accept the view that perceptual and imagistic representations are iconic representations in the above sense and that they obey the principle of compositionality just stated, then the challenge for them is to show how representations without a canonical decomposition could generate representations with a canonical decomposition.

3.2 Interpreting the Evidence for Concept-Empiricism

Among the empirical findings that seem to support concept-empiricism, I will review some evidence from recent cognitive neuroscientific investigations devoted to both the understanding of the meanings of action verbs and numerical cognition. The research into the meanings of action verbs is important because understanding a speaker's and/or addressee's understanding of the meaning of an action verb may tell us something important about their concept of the action described by the verb (cf. Glenberg and Kaschak 2002). Following the discovery of mirror neurons in non-human and human primates, some of this research has been taken to show a significant overlap between the brain areas in the motor system (premotor and motor areas) active during the execution of actions, the perception of actions executed by others and also the processing and understanding of the meanings of verbs describing these actions (cf. Rizzolatti and Craighero 2004). There is evidence that this overlap is congruent with the somatotopic representation of the bodily parts involved in these actions in the motor system, e.g. the tongue for 'lick', the arm for 'pick' and the leg for 'kick' (cf. Hauk et al. 2004; Buccino et al. 2005; Tettamanti et al. 2005; Pulvermüller et al. 2005; Aziz-Zadeh et al. 2006; but see Bedny and Caramazza 2011 for dissent). Further research has been taken to show competition for the same neural resources, in the motor system, between language processing, the planning and the execution of actions (cf. Boulenger et al. 2006;

Boulenger et al. 2008a, b). Willems et al. (2009) have also reported that during a lexical-decision task, right- and left-handers showed contrasting patterns of activity in cortical motor regions when reading manual-action verbs like *grasp* and *throw*, as compared with reading non-manual-action verbs, thereby suggesting that "people with different bodies, who perform actions in systematically different ways, use correspondingly different neural tissues for representing action verb meanings".

There are also findings in domains other than verb understanding that seem to corroborate concept-empiricism. In a particularly interesting experiment on numerical cognition, Sato et al. (2007) applied transcranial magnetic stimulation (TMS) to the hand region of the motor cortex of participants, in order to study changes of excitability in their finger muscles, while they were performing a visual parity judgment task. They applied TMS to the hand region of the motor cortex on either the right or the left hemisphere of participants some 200 ms after the presentation of an Arabic numeral from 1 to 9 (5 excluded) and recorded motor-evoked potentials from two contralateral abductor muscles (on the thumb and little finger) on both hands, while participants were requested to make a parity judgment ('odd' vs. 'even'). The authors found a modulation of the excitability of both muscles *only* for the right hand (controlled by the left motor cortex), not the left hand (controlled by the right motor cortex), specifically for smaller numbers (1 to 4) compared to larger numbers (from 6 to 9).

The authors take their findings as supporting an "embodied finger counting strategy", in which participants use fingers on their right hand (from thumb to little finger) to count integers up to 5. On the face of it, such findings are evidence for body-centrism since they display the dependency of the execution of a particular cognitive task (making parity judgments about integers smaller than 5) upon participants' moving specific bodily parts (the fingers of their right hand). Thus, it seems as if the minds of participants making parity judgments about integers smaller than 5 are realized by their respective brains and fingers of their right hands, not their respective brains alone.

The relevant question is whether these findings show that motor processes and motor representations are *constitutive* of either the understanding of the meanings of action verbs or the ability to make numerical parity judgments about integers smaller than 5. As Pulvermüller (2005: 579) notes about the understanding of the meanings of action verbs, action word recognition could automatically and immediately trigger the activation of specific action-related networks. But alternatively motor activation could be the consequence of a late, post-lexical strategy to imagine or plan an action. If the latter, then concepts of motor acts might still consist in abstract amodal representations. So far then, the evidence cannot rule out Mahon and Caramazza's (2008: 60) version of a "disembodied theory of concept representation", according to which "activation cascades from disembodied (i.e. abstract, amodal and arbitrary) concepts… to the sensory and motor systems that interface with the conceptual system". Concept-empiricism would only be supported by recent findings about the understanding of the meanings of action verbs to the extent that these findings could be taken to support the strong thesis that, in Mahon and Caramazza's (2009: 41) terms, "conceptual content can be reductively grounded in sensory and motor processes" (which of course Mahon and Caramazza deny). So far however, the evidence does not rule out the possibility that, far from sensorimotor processing being constitutive of the understanding of the meanings of action verbs, the latter causes the former.

Mahon and Caramazza's response to concept-empiricism is based on the distinction and the interaction between the conceptual and the sensorimotor systems. It suggests a similar response to the body-centric interpretation of the findings showing that participants move the fingers of their right hands in making parity judgments about integers smaller than 5. These findings could only support body-centrism to the extent that finger movements can be taken to be constitutive of human numerical cognitive competence. But there is an alternative interpretation of these findings based on the intuitive duality between an individual's mind/brain and *bodily tools*, according to which (a) an individual's numerical competence is realized by her brain alone; and (b) in a task of parity judgments about integers smaller than 5, her mind/brain makes use of the fingers of her right hand as a bodily tool to improve or facilitate the execution of the task. On the face of it, the fact that an individual can use tools (e.g. paper and pencil) in order to perform complex arithmetical operations does not seem enough to refute the naïve neuro-centric view that her knowledge of arithmetic is realized by, or supervenes on, her brain alone, not her brain together with paper and pencil. So unless the intuitive distinction between an individual's mind/brain and bodily tools can be shown to be dispensable or fallacious, the findings showing that participants move the fingers of their right hands in making parity judgments about integers smaller than 5 fail to support body-centrism.[6]

Notice that the neuro-centric response to the body-centric interpretation of the findings about finger movements in numerical tasks relies on the intuitive distinction between an agent's mind/brain and her bodily tools that can be used by, without being parts of, the mind/brain. The intuitive mind/tool distinction is consistent with, but it does not directly appeal to, Adams and Aizawa's (2008) critique of what they call the "coupling/constitution fallacy", i.e. the fallacy of sliding from the uncontroversial claim that tools can play a causal role in achieving cognitive tasks to the stronger claim that they are constitutive parts of the individual's mind/brain.[7] If so, then the question for body-centrism is: can one deny the intuitive duality between an individual's mind/brain and bodily tools? The Obamesque answer is: Yes, one can, if one embraces the *extended mind* thesis, which denies that an individual's mind just is realized by her brain alone and claims instead that tools in an individual's environment can be *constitutive* parts of the individual's mind. If non-bodily tools can be constitutive parts of an individual's mind, then arguably so can bodily tools.

4 Assessing the Extended Mind Thesis

As Clark (1997: 53) put it, "mind is a leaky organ, forever escaping its 'natural confines' and mingling shamelessly with body and with world". The following quote

[6] The further question arises whether advocates of body-centrism should concede that bodily parts, which are not artifacts with intended functions, count as tools on a par with artifacts with intended functions. I consider this further question at the end of section 4.

[7] See section 4.2 for further discussion.

from Chalmers (2008: ix-x) provides the most succinct statement of the extended mind thesis:

> I bought an iPhone. The iPhone has already taken over some of the central functions of my brain… The iPhone is part of my mind already… the world is not serving as a mere instrument for the mind. Rather, the relevant pars of the world have become parts of my mind. My iPhone is not my tool, or at least it is not wholly my tool. Parts of it have become parts of me. This is the thesis of the extended mind: when parts of the environment are coupled to the brain in the right way, they become parts of the mind. This is the thesis of the extended mind: when parts of the environment are coupled to the brain in the right way, they become parts of the mind.

It is uncontroversial that many cognitive processes start and end with events taking place outside an individual's brain: in perception and action, "parts of the environment are coupled to the brain in the right way", in Chalmers's (2008) sense. Perception starts, and action ends, outside an individual's brain: the perceptual process starts with a distal stimulus removed from an individual's brain. An individual's action (of e.g. pressing a switch with her index finger) may have effects (e.g. turning on a light bulb) far removed from her brain. But it seems to me that we are not thereby tempted to conclude that an individual's mind or cognition is extended on this basis, and that it should therefore incorporate the distal stimulus and/or the light bulb as proper parts. Should the use of bodily and non-bodily *tools* in *higher* cognitive processes tempt us to so conclude? Or else should we perhaps drop altogether the distinction between a *tool* and the mind/brain of a *tool-user*? In trying to answer these questions, we should assess two complementary arguments, which have been offered by Clark and Chalmers (1998) and Clark (1997, 2002, 2008b) in favor of the extended mind thesis: the functional equivalence argument and the off-loading argument.

4.1 The Functional Equivalence Argument

Inga, a healthy adult, and Otto, a patient with Alzheimer's disease, share the desire to visit the MOMA in New York City. Whereas Inga relies on her biological memory, Otto must consult his notebook in order to retrieve the address of the museum. Clark and Chalmers (1998) assume that Inga's and Otto's respective actions of going to 53rd street in New York City are each guided by a belief with one and the same content about the address of the MOMA. But Inga's belief is based on her biological memory, whereas Otto's belief is based on his notebook. It follows that Otto's notebook played for Otto the same functional role as her biological memory played for Inga in forming her belief about the address of the MOMA. It follows more generally that the vehicles of an individual's beliefs can be located outside the boundaries of his or her skull, brain and skin. If so, then the extended mind thesis is vindicated.

We have, I think, strongly competing intuitions about the functional equivalence of Inga's and Otto's beliefs about the address of the MOMA: we uncontroversially ascribe to Inga the belief that the MOMA is on 53rd street. Should we ascribe the same belief to Otto or to Otto *and* his notebook? It is hard to know and not to beg the question for or against the extended mind thesis. Furthermore, it is hard to assess the

functional equivalence argument because the thought-experiment seriously underspecifies the condition of Otto, the patient with Alzheimer's disease, both downstream and upstream from his belief about the location of the MOMA. Are Inga's and Otto's beliefs functionally equivalent from upstream? Clearly, the processes whereby Inga and Otto formed their respective beliefs are different: only Otto, not Inga, had to perform the intentional action of opening his notebook, find the right page, and read words that he had previously written on the page. Are Inga's and Otto's beliefs functionally equivalent downstream? Do they have the same consequences (or functional roles) on Inga's and Otto's behavior? It depends to a large extent on how Otto's mental condition is described: it depends on whether having consulted his notebook, Otto will be able to navigate through the streets of New York City, remember his goal throughout, and find the location of the MOMA. So it is hard to assess the consequences of Otto's belief on his subsequent action and his other mental states. But the reasons we have for doubting that the processes of belief-formation at work in Inga and Otto and the consequences of the relevant belief on Inga's and Otto's action and other mental states are the same are precisely reasons to resist the conclusion of the functional equivalence argument drawn by Clark and Chalmers (1998).

So far, we considered problems raised by extending Otto's mind to include his notebook on the grounds that Otto's brain and his notebook form "a coupled system that can be seen as a cognitive system in its own right" (Clark and Chalmers 1998). Now, like states of Otto's brain, Otto's notebook has intentionality. But as argued by Adams and Aizawa (2008) and Fodor (2009), unlike states of Otto's brain, the intentionality of Otto's notebook is *derived* from the intentionality of states of Otto's brain. Had not Otto's brain encoded the address of the MOMA before Otto transcribed it into his notebook, Otto would be unable to retrieve it from his notebook later. If the address encoded in the notebook turns out to be mistaken, then Otto should blame himself, not the notebook. Otto might either have had a wrong belief about the address of the MOMA before he transcribed it into his notebook or else he might have wrongly transcribed his correct belief into his notebook. But one thing is clear: the notebook itself did not actively deceive Otto about the address of the MOMA.

But now consider what happens when the extended mind thesis applies to human social cognition, i.e. when two human brains form a "coupled system that can be seen as a cognitive system in its own right". For example, with Fodor (2009), suppose that Inga asks Otto where the museum is. Otto consults his notebook and tells Inga. Now Inga's belief about the address of the MOMA was formed through verbal communication with Otto. It seems as if by the application of the extended mind thesis to human social cognition, Otto's mind should be part of Inga's mind, since Otto's belief contributed to the formation of Inga's belief. But if so, then Otto's notebook, which is part of Otto's mind, should also be part of Inga's mind. As Fodor (2009) points out, now "it looks as though if Otto loses his notebook, Inga loses part of her mind" (cf. Clark 2009 for a reply).

Whether or not Otto loses part of his mind, it sounds odd to be forced to say that if Otto loses his notebook, then Inga loses part of *her mind*. (Otto's notebook belongs to Otto, not to Inga.) On pain of denying that 'part of' expresses a transitive relation, there are two ways one could deny that if Otto loses his notebook,

Inga loses part of her mind. One could deny either that Otto's notebook is part of Otto's mind or that Otto's mind is part of Inga's mind. We have already addressed the first issue. I now want to explain why we have, I think, special grounds for rejecting the application of the extended mind thesis to human social cognition or denying that two brains form "a coupled system that can be seen as a cognitive system in its own right".

Humans typically acquire many of their beliefs from others' testimony, i.e. by verbal communication. But not every belief so acquired is true: not every speaker is both competent and benevolent. Unlike Otto's notebook, Otto might want to play a trick on Inga or actively seek to deceive her, or else he might be incompetent. As stressed by Sperber (2001) and Sperber et al. (2010), an individual's beliefs acquired by verbal communication differ in many respects from his beliefs acquired by perception: on the one hand, a speaker may actively deceive an addressee. On the other hand, unlike other animals (e.g. bees), for a given speaker's meaning, a human addressee is not forced to automatically accept as true the content of another's testimony.[8] From an evolutionary perspective, communicators and receivers must stand to gain from communication: unless both the production and reception of messages had been advantageous, communication would have failed to stabilize among humans. Nonetheless, deceptive communication is not out of the question; the interests of communicators and receivers are not identical: the addressee of an act of assertion will generally be better off if the content of the speaker's testimony is true rather than false. But the speaker will generally be better off if the addressee trusts her rather than distrusts her, whether or not her testimony is true (cf. Sperber 2001). Should we consider the mind of a speaker who actively seeks (or might seek) to deceive her addressee part of the addressee's mind? I think the answer is that it would make little sense.

As Clark and Chalmers (1998) have noticed, our intuitions about the boundaries between an individual's mind and the rest of the world strongly overlap with our intuitions about the boundaries of her *self*. Thus, the further question arises whether the extended mind thesis should be extended from minds to selves. In the penultimate paragraph of their paper, Clark and Chalmers (1998) seem to recommend a positive answer to this question, which would be consonant with their endorsement of the application of the extended mind thesis to human social cognition. If so, then they would presumably bite the bullet and accept jointly that Otto's notebook is part of Otto's mind, that Otto's mind is part of Inga's mind and that if Otto loses his notebook, then Inga does lose part of her mind. But the fact that in general the interests of an addressee diverge from those of a speaker is a good reason for rejecting the application of the extended mind thesis to human social cognition, i.e. for denying that the brains of a speaker and her addressee form "a coupled system that can be seen

[8] Perception can be illusory, but if so, then the illusion is not actively caused by a deceiver. As Sperber (2001) and Sperber et al. (2010) have emphasized, humans have developed particular tools for assessing the reliability and trustworthiness of the sources of communicated information because they are vulnerable to deception via communication. I am aware that some philosophers in the Reidian tradition have argued for a close similarity between perceptually formed beliefs and communication-based beliefs (e.g. Millikan 1984 and Burge 1993), but I am not convinced.

as a cognitive system in its own right" and therefore for rejecting the extension of the extended mind thesis from minds to selves.[9]

4.2 The Off-Loading Argument

Although the first functional equivalence argument does not decisively support the extended mind thesis, there is a second argument in its favor: I will call it the "off-loading" argument. At the root of the off-loading argument is the intuitive thought that since thinking with a naked brain is really hard, we better make the environment smart so that we don't have to be. It is well epitomized by the following passage from Dennett (1996: 177–178):

> The primary source (of our greater intelligence than our nearest relatives) is our habit of off-loading as much as possible of our cognitive tasks into the environment itself—extruding our minds… into the surrounding world, where a host of peripheral devices we construct can store, process, and re-present our meanings, streamlining, enhancing, and protecting the processes of transformation that *are* our thinking. This practice of off-loading releases us from the limitations of our animal brains.

As Dennett (1996) himself has stressed, members of other animal species also off-load some of their own cognitive tasks onto their environment: for example, ants famously lay down and track pheromone trails for purposes of navigation. But Dennett is certainly right that in humans, this ability reaches a pinnacle.

The question is: how does one move from Dennett's important observation that humans are experts at building tools that will enable them to off-load much of the burden of their cognitive tasks onto the environment to the extended mind thesis? Arguably, one of the most efficient tools used by humans to off-load the burden of their biological semantic memory onto their environment is storing and retrieving written information, i.e. writing and reading words, phrases and sentences of natural languages. Now only *literate* humans have learnt to read and write, which (as much recent cognitive neuroscientific research shows) they could not do unless a small part of the left fusiform gyrus (itself a small area in the human visual cortex), known as the Visual Word Form Area (VWFA), had become a specialized interface between human vision and the human language faculty (cf. McCandliss et al. 2003; Dehaene and Cohen 2011). In other words, as I argued in my 2002 review of Rowlands 1999, the off-loading argument points towards a *trade-off*: decreasing the need for a large memory storage capacity requires augmenting some of the resources of the human visual system, which can be achieved by converting part of the left fusiform gyrus into the VWFA for the visual perception of the form of written words.

But if so, then the off-loading argument for the extended mind thesis interestingly differs from standard Twin-Earth arguments for *content-externalism* (made popular

[9] As I argue in section 4.2, the arguments for the extended mind thesis interestingly differ from Twin-Earth arguments for content-externalism. Notice also that the application of the extended mind thesis to human social cognition interestingly differs from the kind of social externalism advocated by Burge (1979), according to which what members of an individual's community think may be constitutive of the contents of some of the individual's thoughts. Burge's social externalism has no externalist implications for the self.

by Putnam 1975). Content-externalists typically argue for the contribution of an individual's environment to the contents of her thoughts by showing that in two relevantly different environments (e.g. Earth and Twin-Earth), one would be inclined to ascribe two different thought-contents to the individual, on the assumption that the individual's brain resources are kept constant throughout the environmental changes. By contrast, the off-loading argument for extending an individual's mind to tools (e.g. books) cannot keep an individual's brain resources constant because the brains of literate humans differ from the brains of illiterate humans: only in the former, not in the latter, has part of the left fusiform gyrus been recruited as the VWFA.

Thus, it seems as if the off-loading argument supports an uncontroversial conclusion, but one which falls short of the extended mind thesis. It is uncontroversially true that use of bodily and non-bodily tools causally enhances an individual's cognitive performance. The reason that this claim is uncontroversial is that it is compatible with the naïve and intuitive distinction between a bodily or a non-bodily *tool* and the *mind* of either a tool-user or a toolmaker. What is controversial is the stronger claim that bodily and non-bodily tools are *constitutive parts of the mind* of either a tool-user or a toolmaker. It is equally questionable whether enhancement of an individual's *performance* in executing a cognitive task should be equated with enlargement of her *competence*: by depriving a literate individual of a book, one does not thereby destroy her VWFA and impair her reading capacity. The competence/performance confusion strikes a familiar behaviorist chord. If so, then in and of itself, the off-loading argument is not sufficient to establish either of the stronger controversial conclusions because it is consistent with the intuitive distinction between tools and the mind of either a tool-user or a toolmaker.

The burden of the extended mind thesis is to dismantle the intuitive dualism between (bodily and non-bodily) *tools* and a tool-user's *mind* by showing that bodily and non-bodily tools are constitutive of a tool-user's mind. I have examined two basic arguments—the functional equivalence and the off-loading arguments—and I have found them inadequate to fulfill their designated function. If so, then the extended mind thesis cannot be recruited by the body-centric interpretation of the findings in support of concept-empiricism.

Since advocates of the extended mind thesis reject the distinction between derived and underived intentionality, they can also presumably reject the distinction between the intended function of an artifact and the evolved function of a bodily part. If so, then they can also accept to construe an individual's bodily parts as tools with evolved functions, but without intended functions. This is why the "larger mechanism story" is consistent with computationalism. But the question arises whether advocates of body-centrism should deny that an individual's bodily parts without intended functions count as bodily tools. Advocates of body-centrism who deny that an individual's bodily parts count as bodily tools (e.g. Dempsey and Shani 2012) opt for strong body-centrism.

To accept strong body-centrism is: (a) to give up the computational approach to the mind; (b) to argue for a sharp divide between bodily and non-bodily tools; (c) to concede that non-bodily tools are not constitutive of an individual's mind; but (d) to stick to the claim that a brain's non-neural bodily environment is so constitutive. To justify the duality between non-neural bodily parts and non-bodily tools, strong body-

centrism might appeal to e.g. the phenomenology of the sense of ownership of one's own bodily parts that has no counterpart in the case of the ownership of non-bodily tools.

But if so, then strong body-centrism faces two challenges. On the one hand, since it rejects the computational approach to the mind, strong body-centrism cannot endorse concept-empiricism of the canonical kind described above. In particular, advocates of strong body-centrism who reject computationalism because they reject a representationalist approach to the mind must offer some non-representationalist alternative approach to the contents of concepts and the nature of conceptual processing or else argue for an eliminativist stance on concepts. On the other hand, since it rejects a functionalist approach to the body and accepts the dualism between bodily parts and non-bodily tools, strong body-centrism must accommodate the evidence showing that a non-bodily tool, e.g. a rake or a grabber, can be selectively incorporated into an agent's body-schema after the agent has learnt to use the non-bodily tool, e.g. to extend her peripersonal space (cf. Maravita and Iriki 2004 for non-human primates and Cardinali et al. 2009 for humans). Indeed, Maravita and Iriki (2004) report that, in monkeys, only the visual receptive fields of neurons with somatosensory receptive fields on the arm/hand, not on the fingers, expanded after tool-use. They further hypothesize that this restriction reflects the fact that a rake constitutes a functional extension of the hand and forearm, not the fingers, since it allows reaching, but not grasping with precision-grip. While this finding can be accommodated by the functionalist approach to the body adopted by weak body-centrism, it seems more challenging for the strong body-centric dualism between the non-neural body and non-bodily tools.

5 Concluding Remarks

I started with Clark's (2008a) observation that there are two ways to reject the neuro-centric claim that an individual's mind is realized by her brain alone: body-centrism and the extended mind thesis. But I pointed out that there are two versions of body-centrism: weak body-centrism, which is an incomplete version of the extended mind thesis, and strong body-centrism, which makes the brain's non-neural bodily environment a special constitutive part of an individual's mind. While weak body-centrism, like the extended mind thesis, is consistent with the computational approach to the mind, strong body-centrism is not, because it involves the rejection of a representationalist approach to the mind and mental phenomena.

Concept-empiricism can be construed as a weak body-centric approach to human concepts and conceptual processing that is consistent with the computational approach. But as an approach to human concepts, concept-empiricism has a number of unattractive features. Furthermore, weak body-centrism is not the inevitable interpretation of the findings offered by advocates of concept-empiricism: there is an alternative disembodied interpretation of the findings based on the intuitive duality between an individual's brain and bodily tools. At this point, advocates of weak body-centrism, who do not reject the computational approach to the mind, could appeal to arguments in favor of the extended

mind thesis in order to dismantle the mind/tool dualism and show that bodily and non-bodily tools are constitutive parts of an individual's mind. However, I have found these arguments inadequate to this task. Now, if the extended mind thesis cannot stand up to scrutiny, then neither can weak body-centrism (which is merely an incomplete version of the extended mind thesis).

At this point then, strong body-centrism, according to which there is a gap between non-bodily tools and the non-neural bodily environment of an individual's brain, is still an option. But strong body-centrism now faces two challenges: on the one hand, it must show that, in spite of its rejection of the computationalist and representationalist approaches to the mind, it still has the resources to accommodate the nature and contents of human concepts. On the other hand, it must also show that the duality between non-bodily tools and an individual's non-neural bodily anatomy is not refuted by experimental findings showing that after tool use, a non-bodily tool can be incorporated into an agent's body-schema.

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